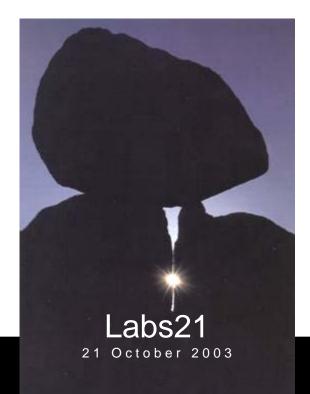
Science and Technology Facility

The Next Step in Sustainability for the National Renewable Energy Laboratory



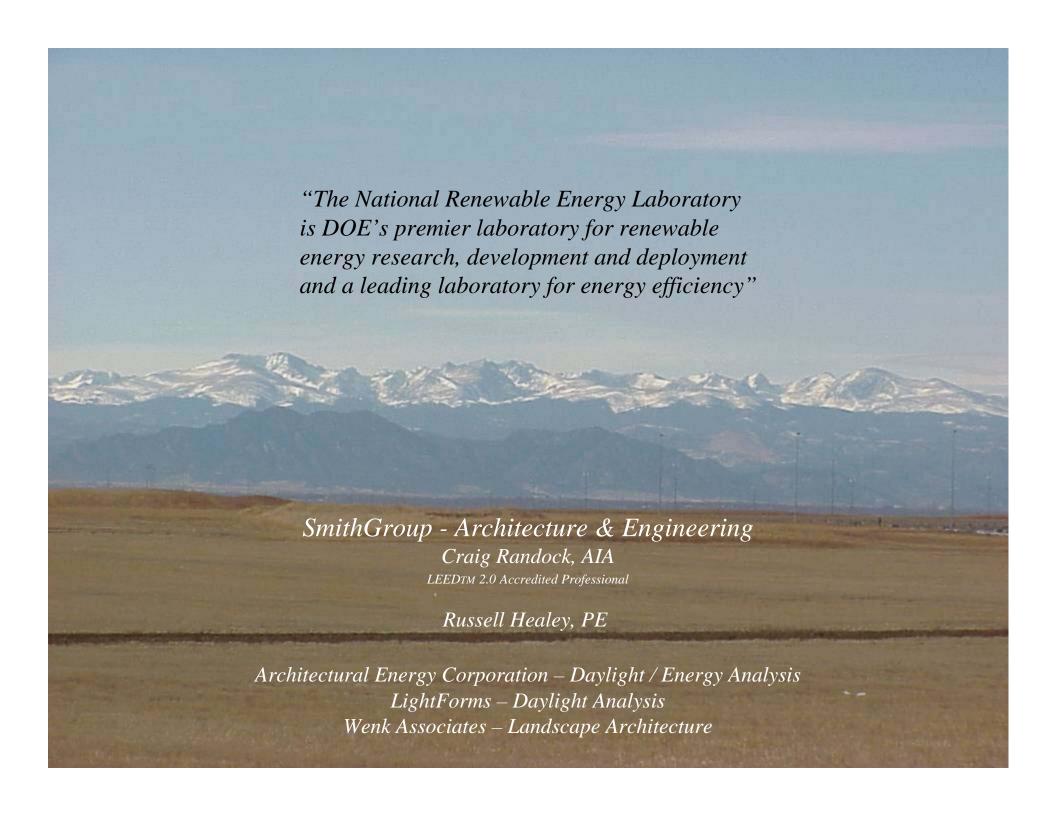


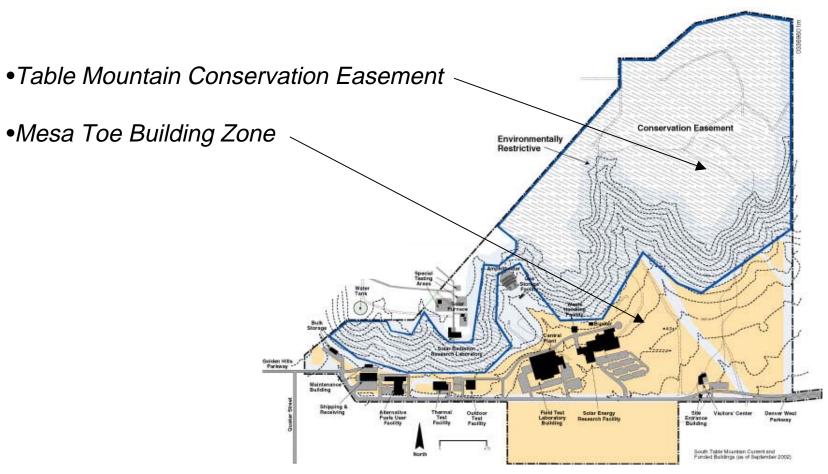


Table Mountain-

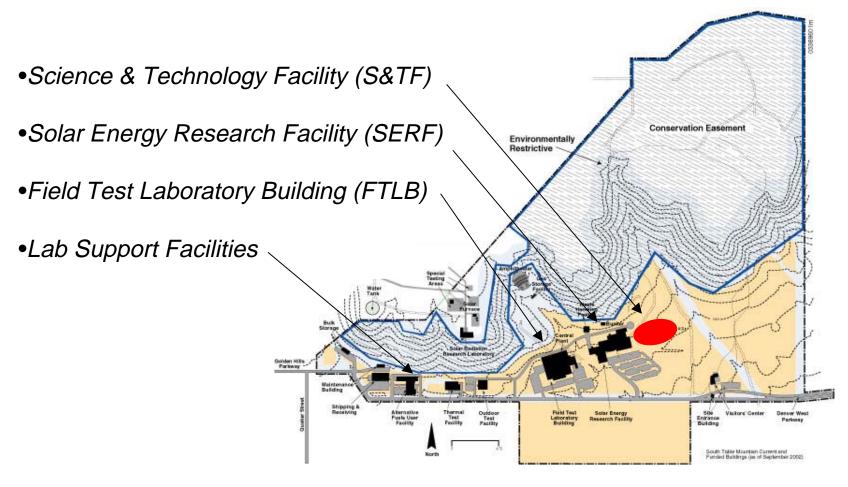


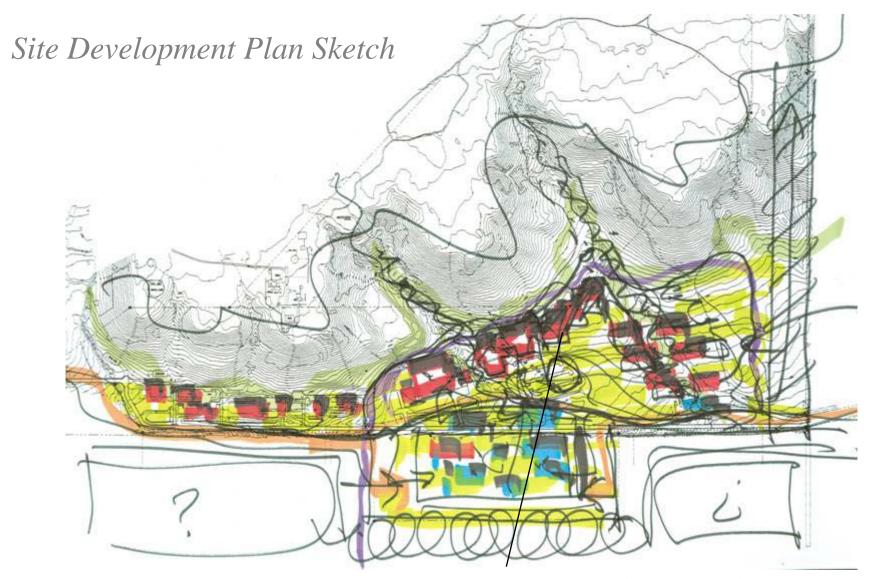
Golden, Colorado

Site Development Plan for the National Renewable Energy Laboratory Golden, Colorado September 2003



Site Development Plan for the National Renewable Energy Laboratory Golden, Colorado September 2003





Science & Technology Facility



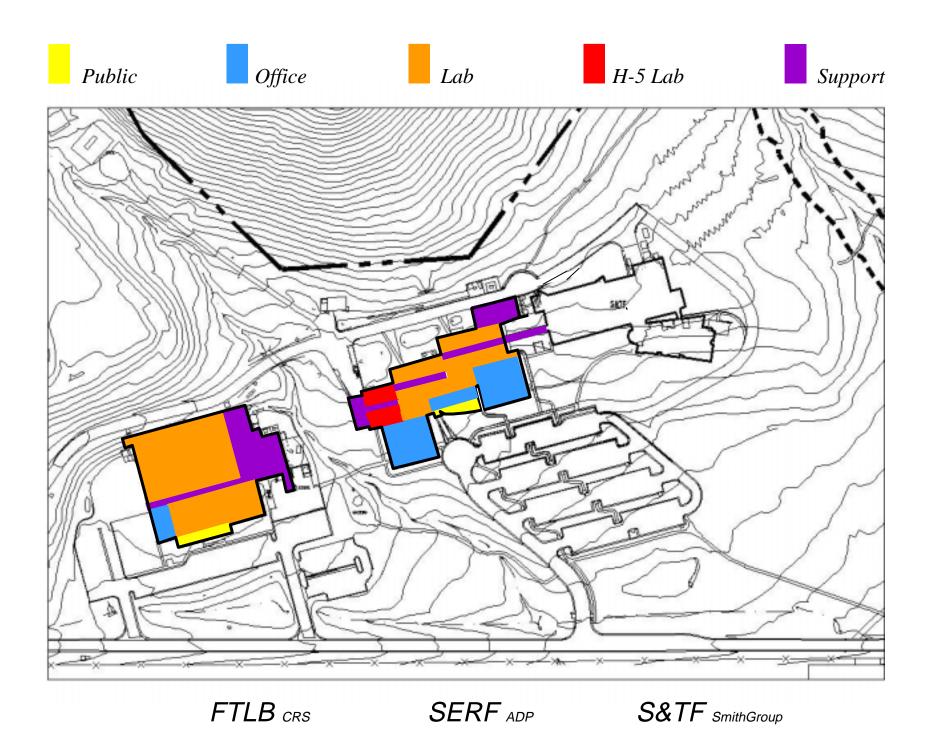
NREL Campus

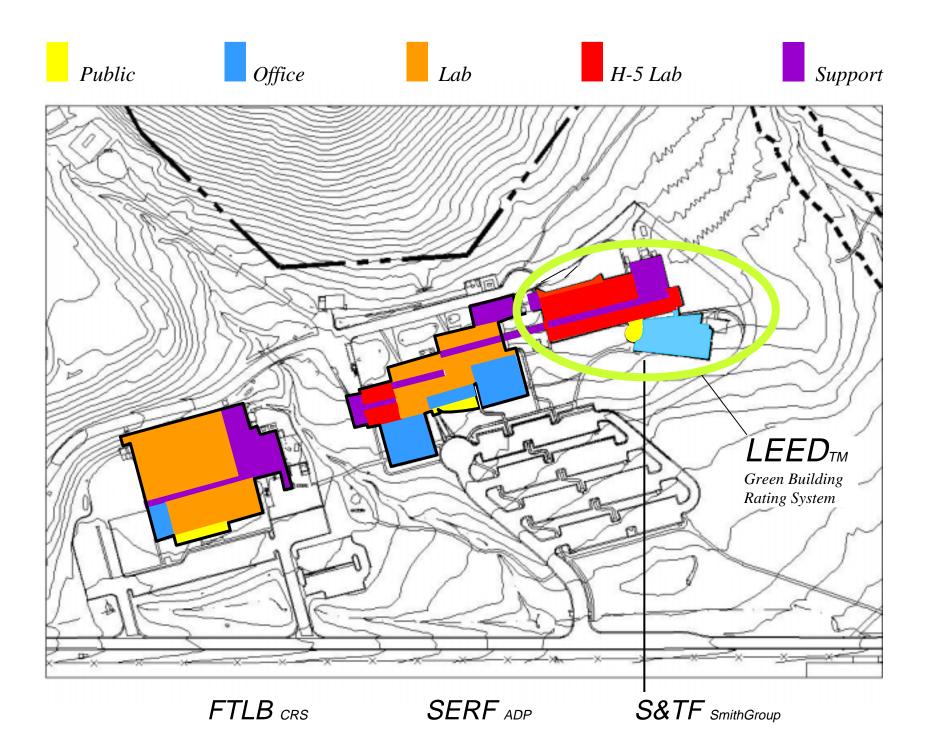


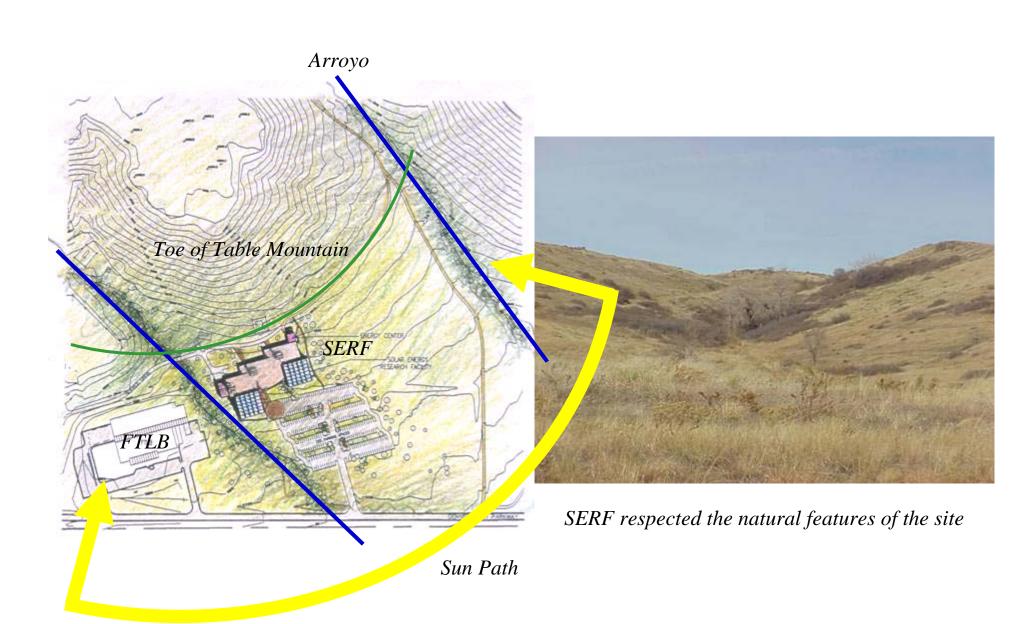
S&TF Site

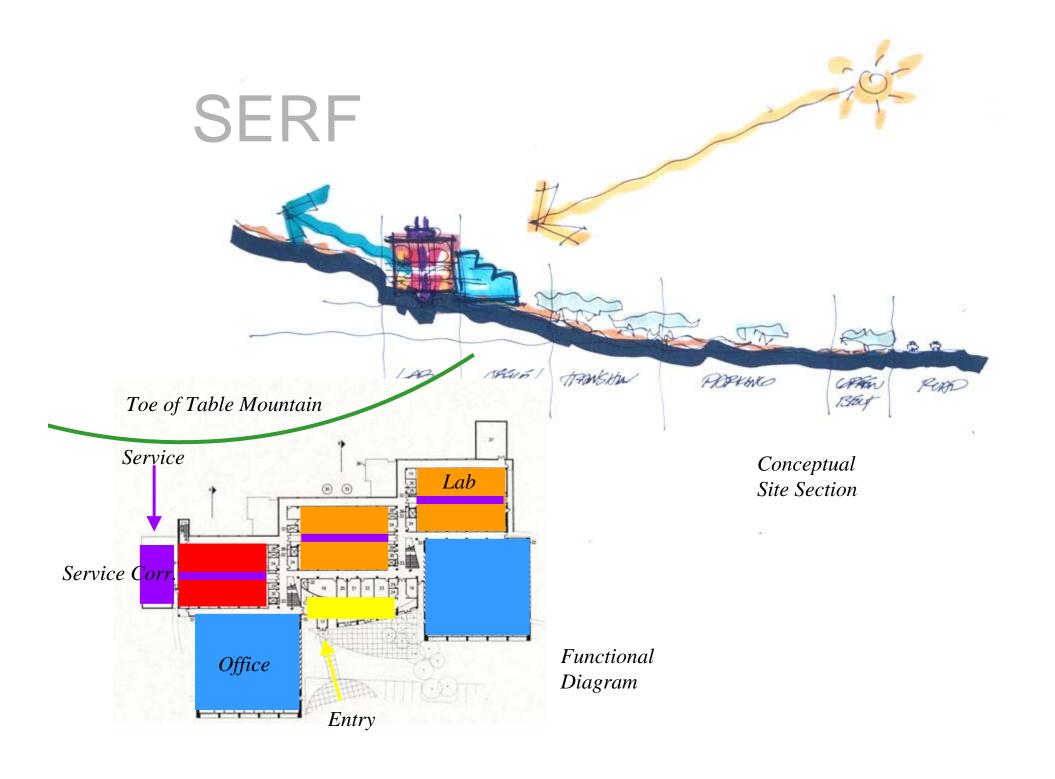


SERF FTLB

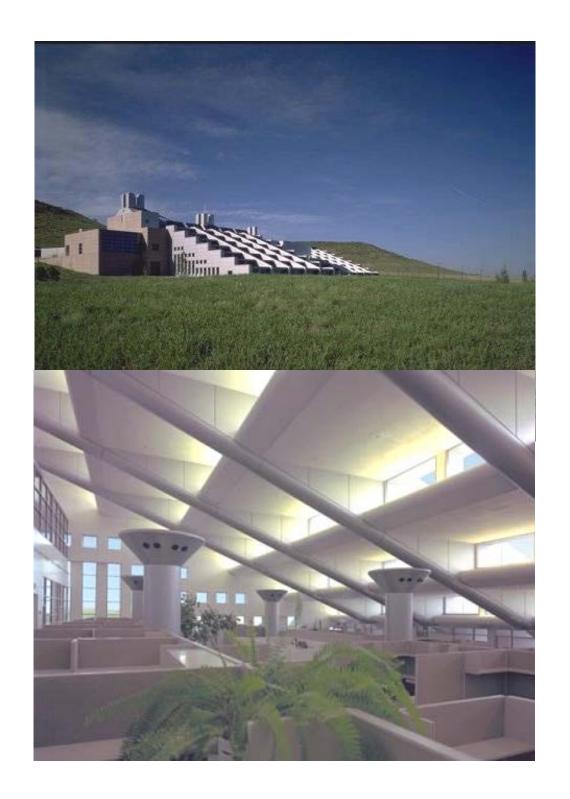




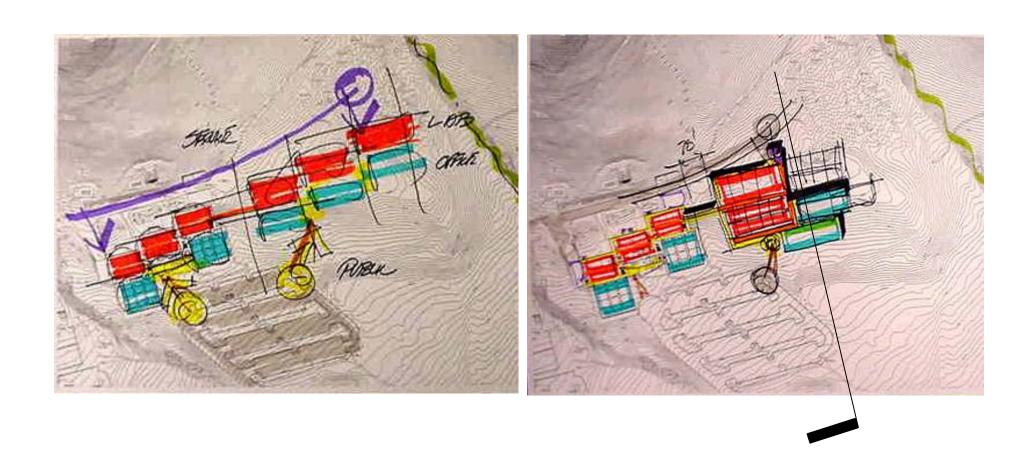






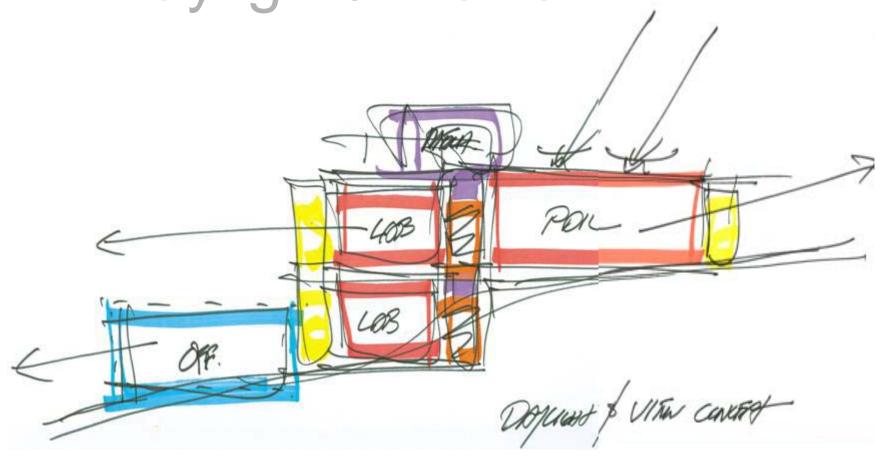


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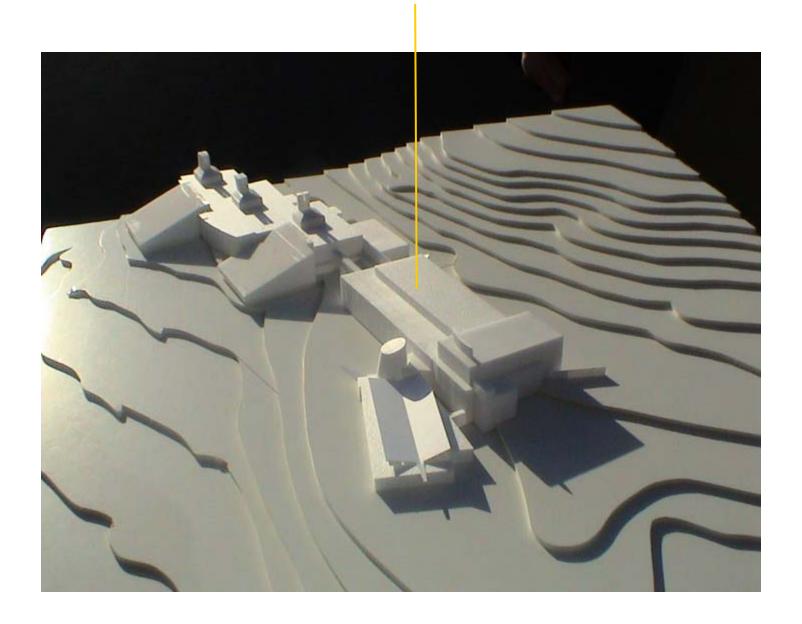


The Science & Technology Facility will utilize the existing parking

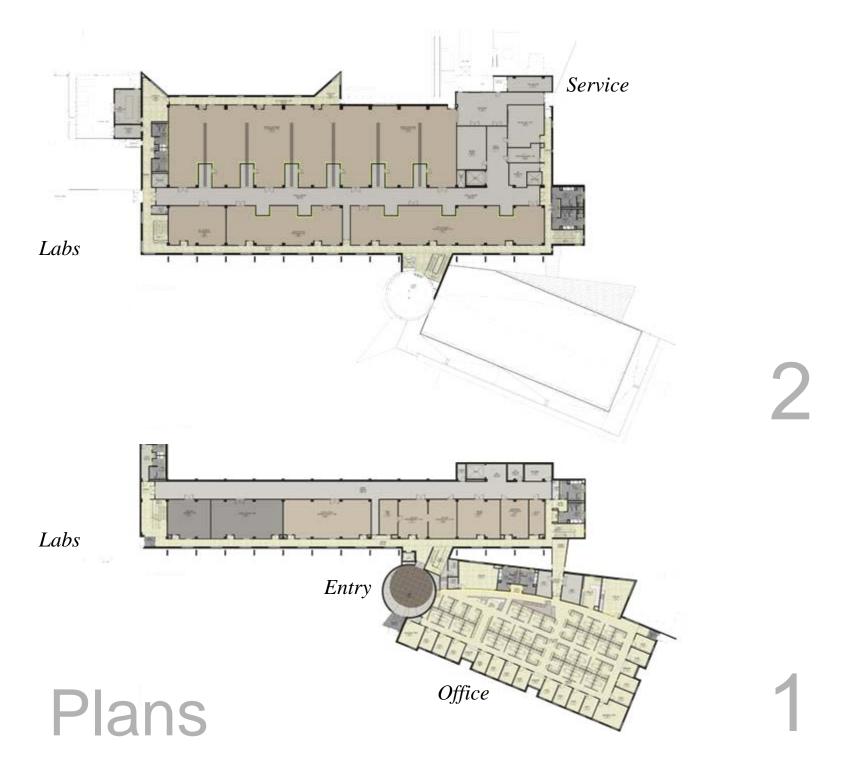
Daylight / Views

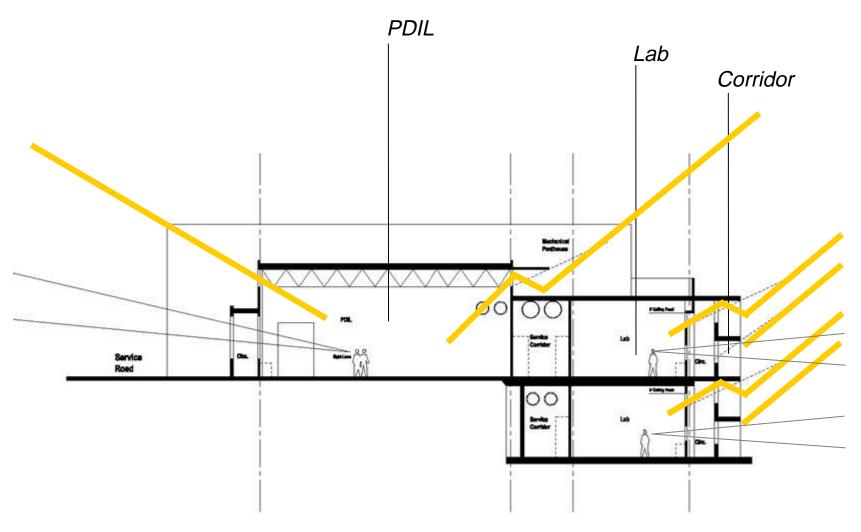


S&TF

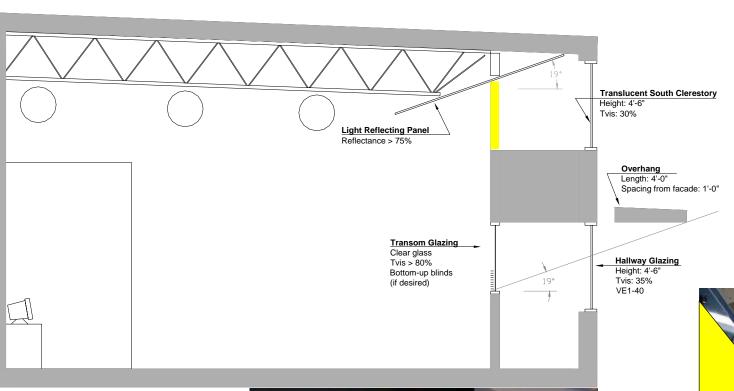




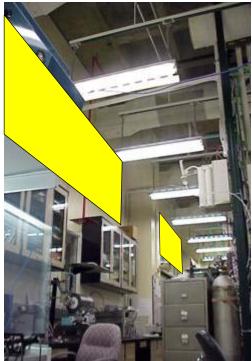


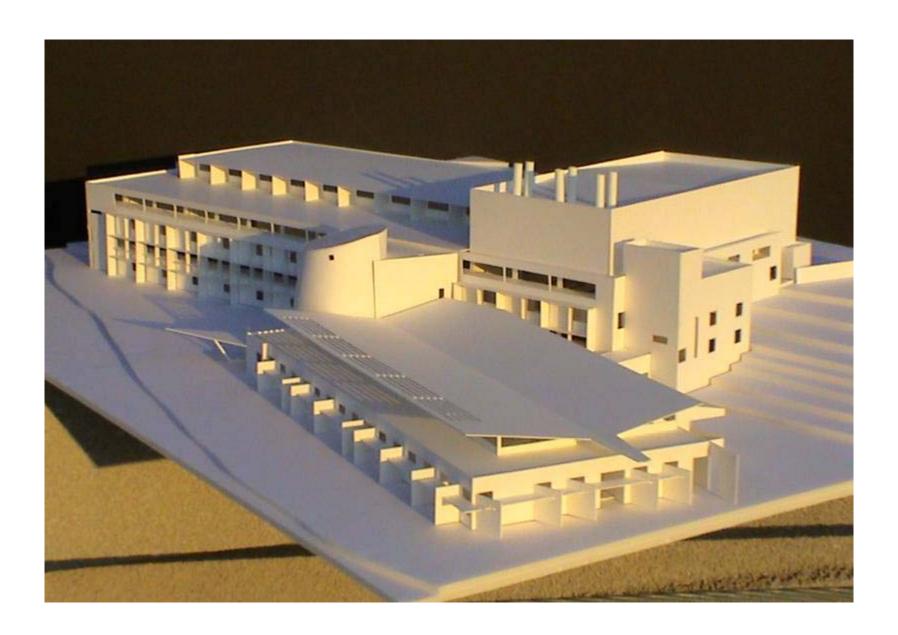


Section

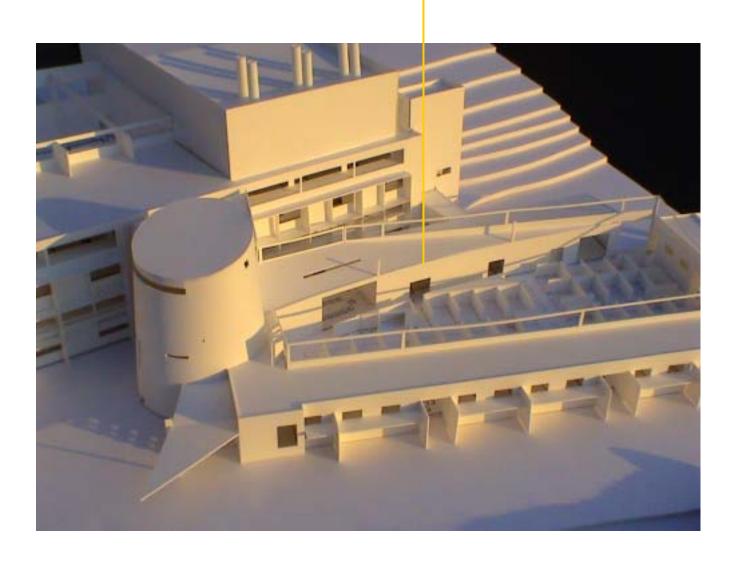




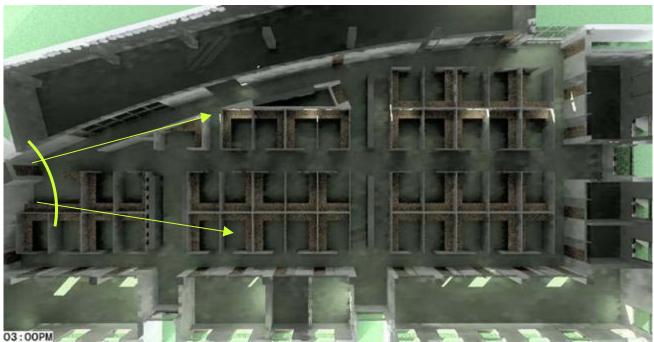


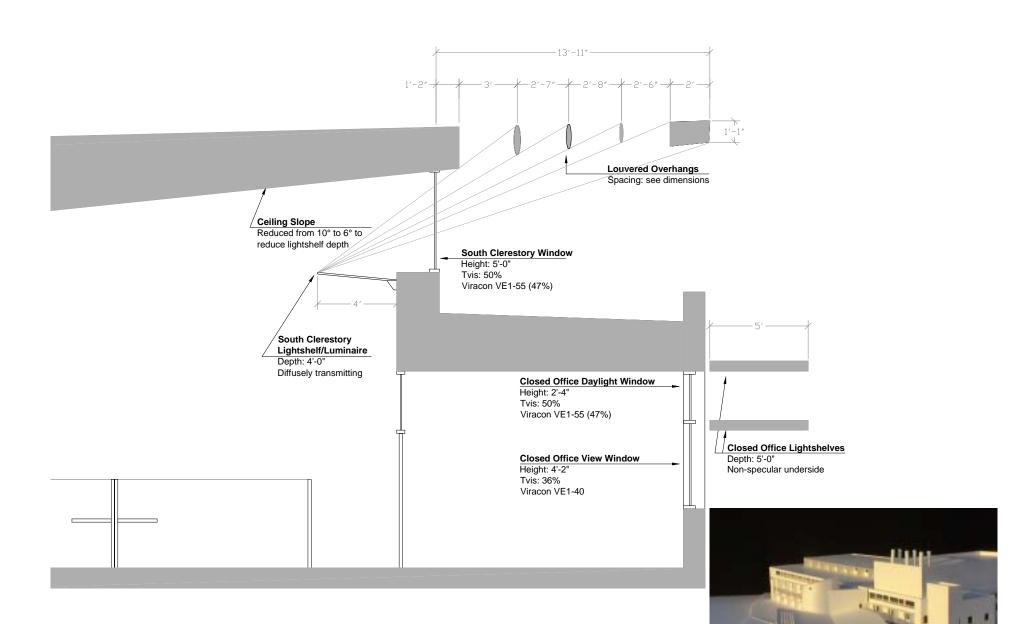


Office



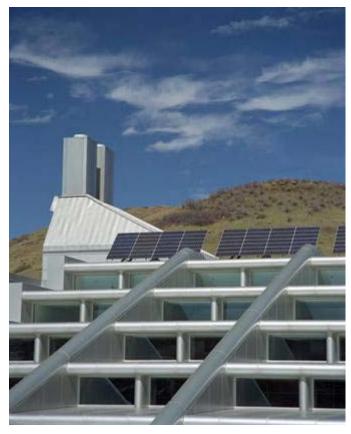


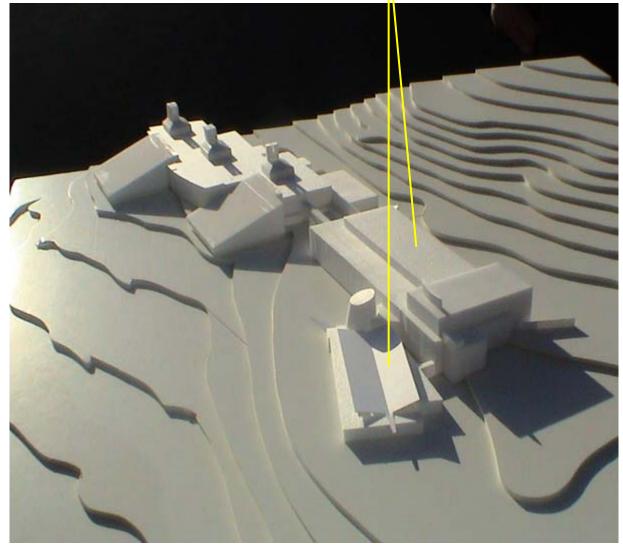


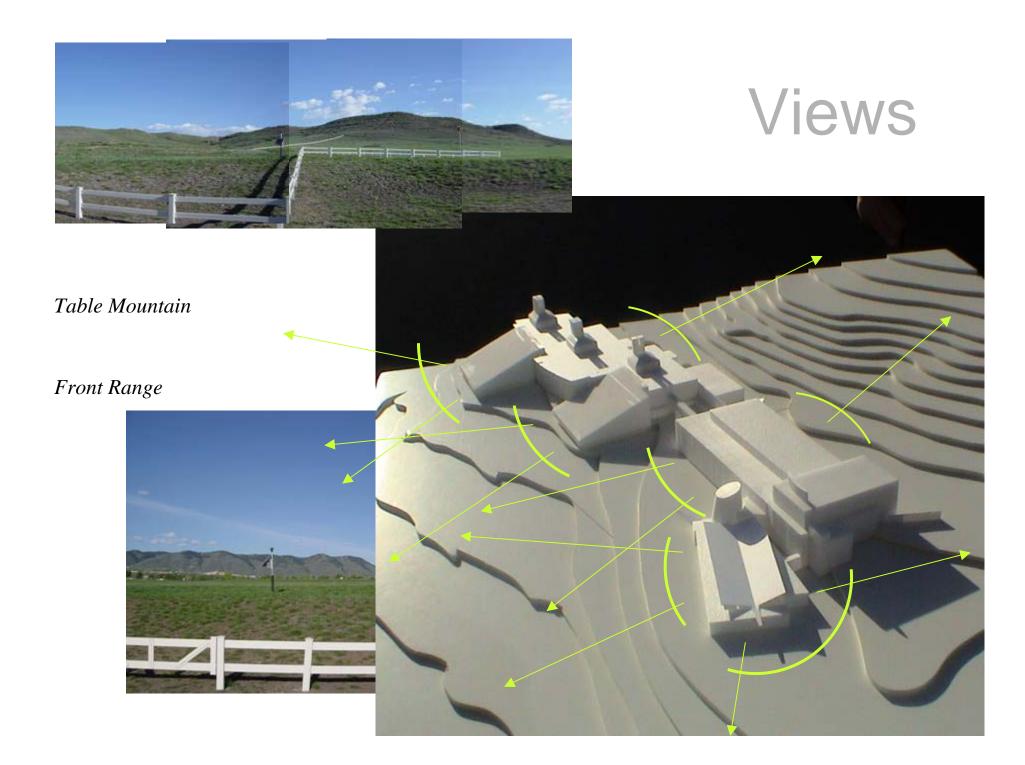




PV

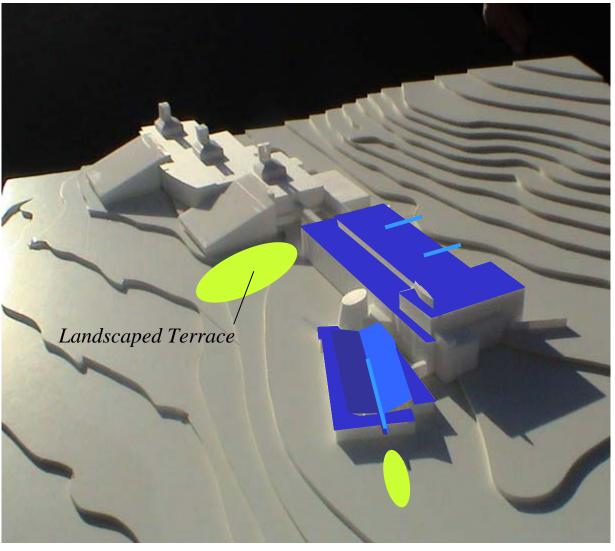




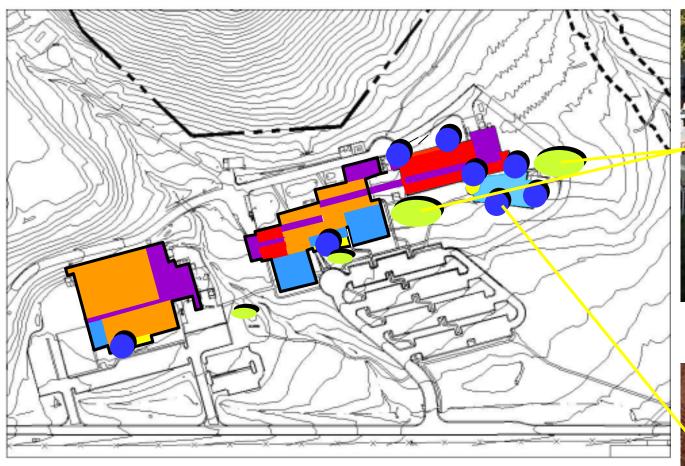




Water Harvesting



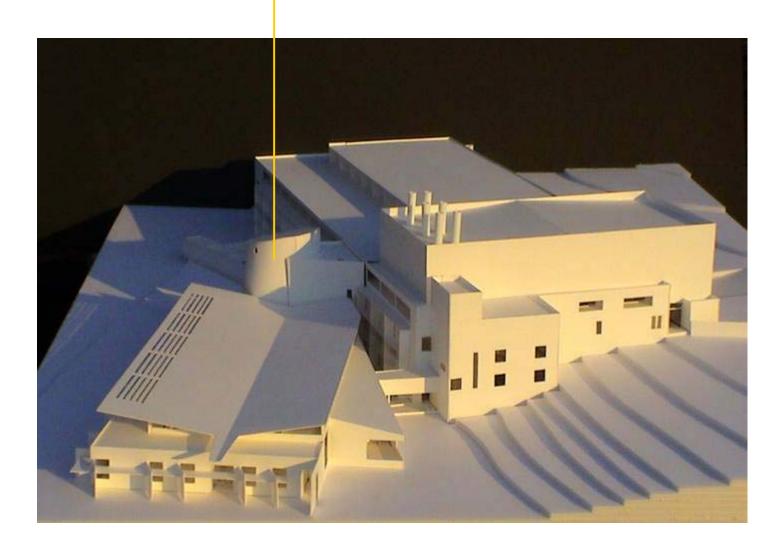
Interaction Spaces





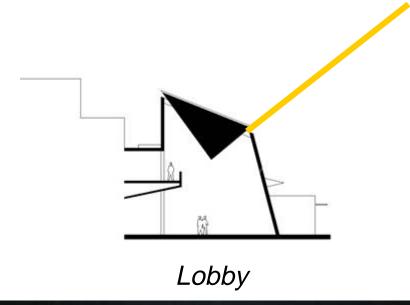


Entry

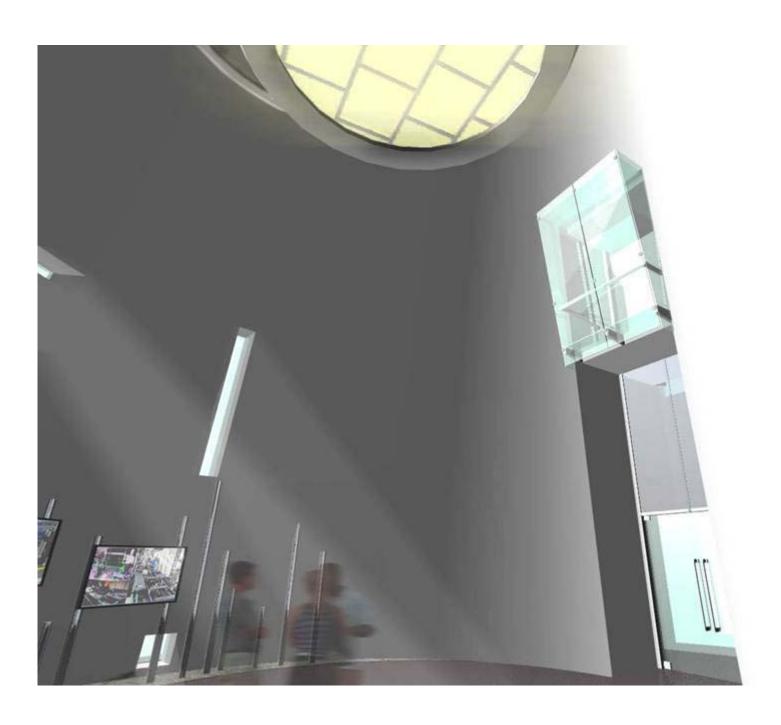


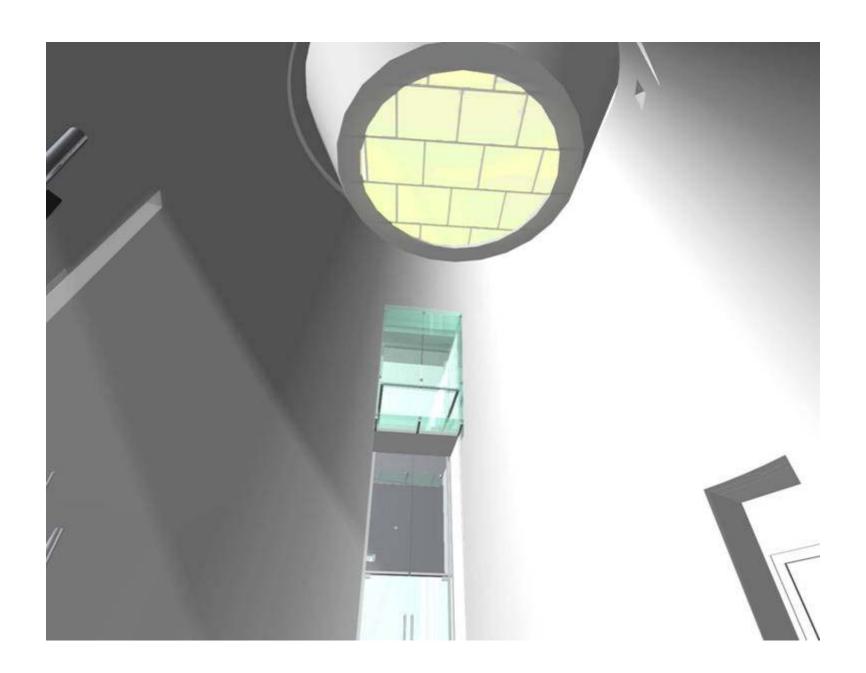


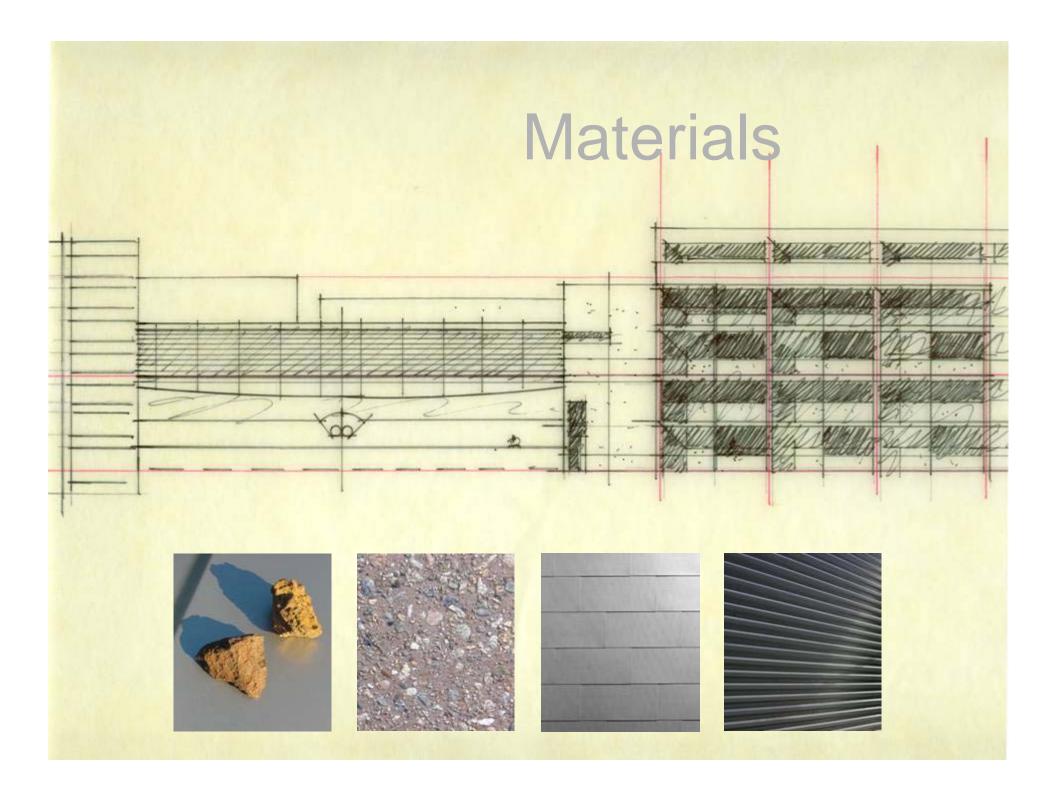






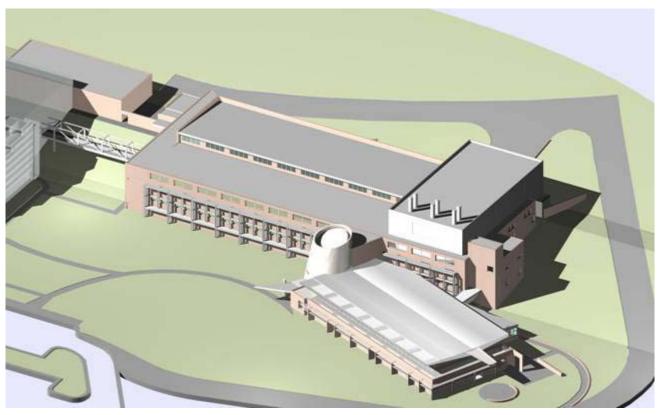








Systems Basis for DOE2 Geometry



Design Criteria

• **Site Location** – Golden, Colorado

Elevation 5,283 ft.
Latitude 39.45 N
Longitude 104.52 W

Outdoor Conditions

Basis: 2001 ASHRAE

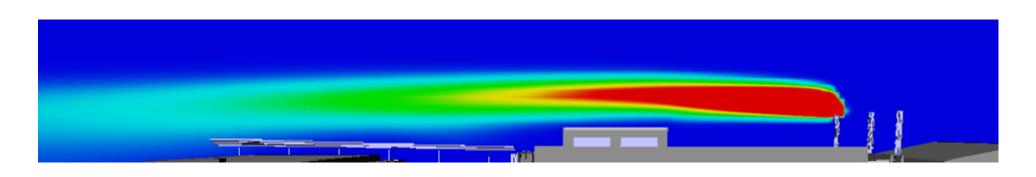
Summer (coincident) 93 °F db, 59 °F wb °F

Design summer wet bulb 64 °F wb

Winter -5 °F db

Cooling Degree Days: 695 CCD65

Heating Degree Days: 6016 HDD65

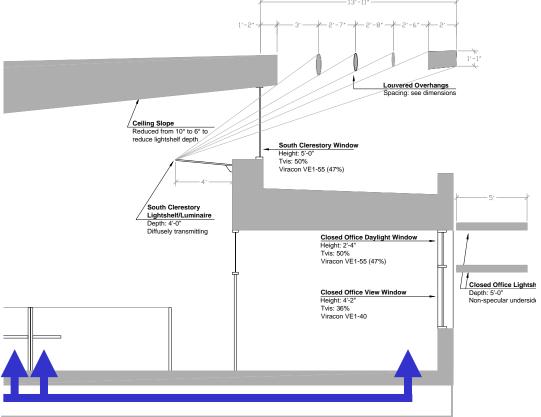


Comparison of Baseline ASHRAE-90.1 2001 and S&TF Title II Design

Characteristic	ASHRAE 90.1-2001 Energy Cost Budget Building	STF Title II Laboratory Design
Lighting control	Manual space and automatic sweep control	Automatic dimmable day lighting control
Laboratory zone controls	Constant volume w/reheat	Variable Volume with Fan Coil Units for supplemental heating and cooling
Laboratory fume hood unoccupied air flow setback	Hood open 18" and exhausting at 100 fpm	50% of design air flow
Laboratory exhaust air heat recovery	No heat recovery modeled.	Run-around coil system. 63% efficient
Chiller efficiency @ ARI standard conditions	0.80 kW/ton	0.449 kW/ton with variable speed drive
Boiler Performance	80% full-load steady-state combustion efficiency for boilers sized 2.5 – 10.0 Mbtu input and all boilers	97% efficiency
Office HVAC system	Standard VAV system with 55 °F Supply Air Temperature	Under floor air system with fan powered terminal boxes and 63 °F supply air temperature
Office and laboratory cooling	Water cooled chiller	Evaporative cooling with water-cooled chiller backup
Tower fan control	Two-speed fans	Variable speed fans
Annual energy cost (including both regulated and unregulated loads)	\$360,464	\$245,495 (32% annual energy savings over ASHRAE baseline)
Annual energy cost (including only regulated loads)	\$273,736	\$158,767 (42% annual energy savings over ASHRAE baseline)

Under floor Air Distribution

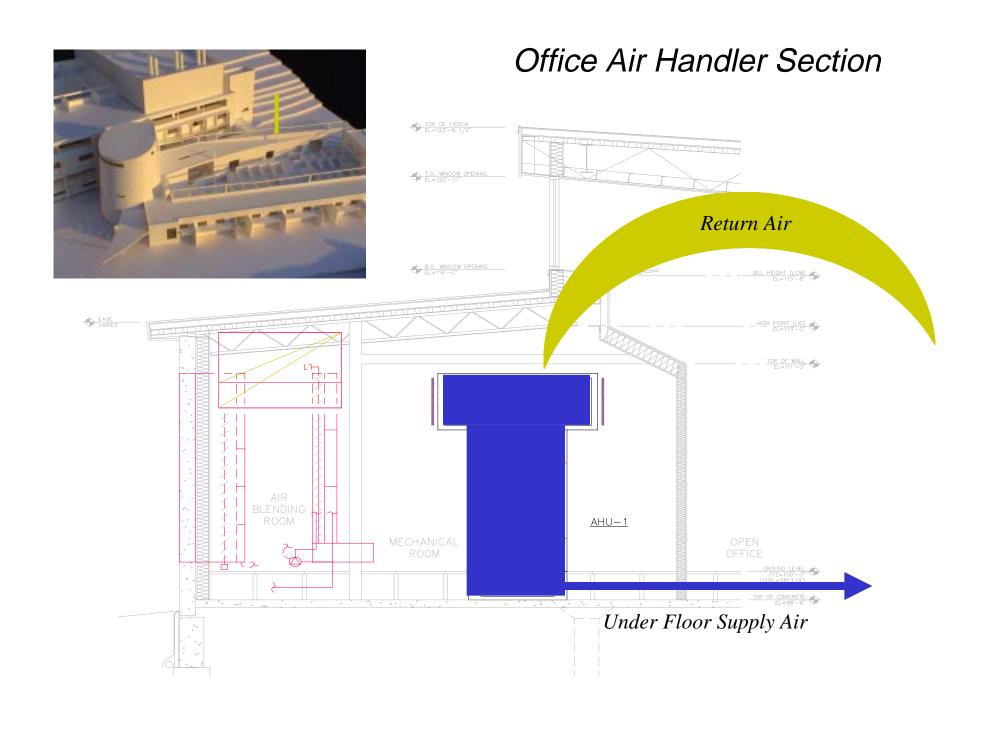




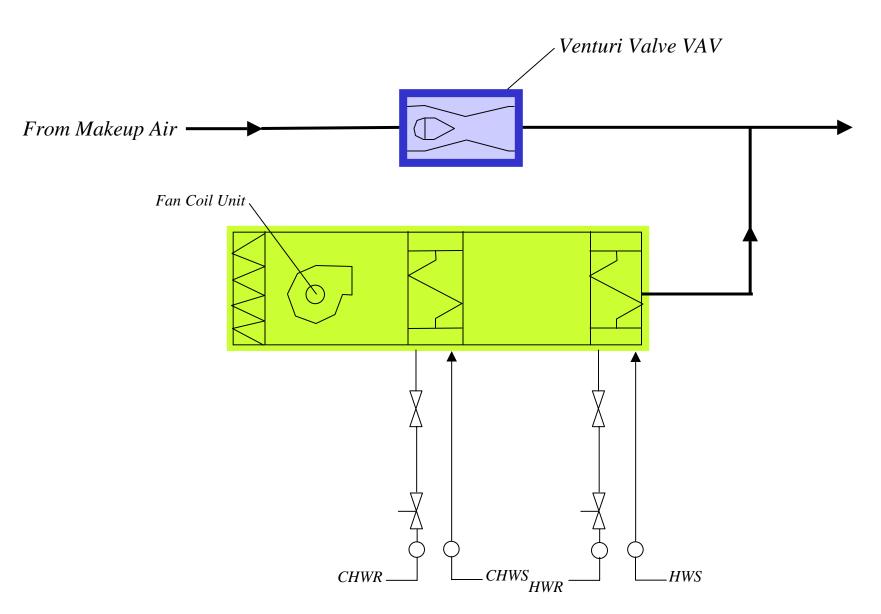
"Individual Control"

SERF

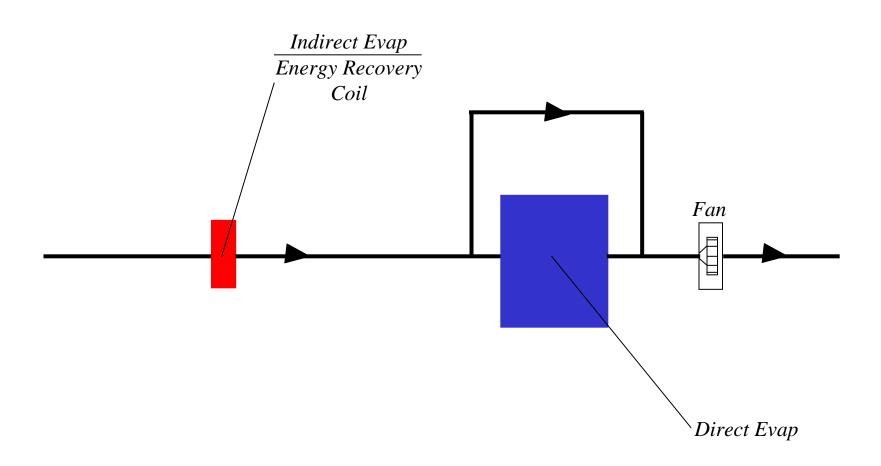
S&TF



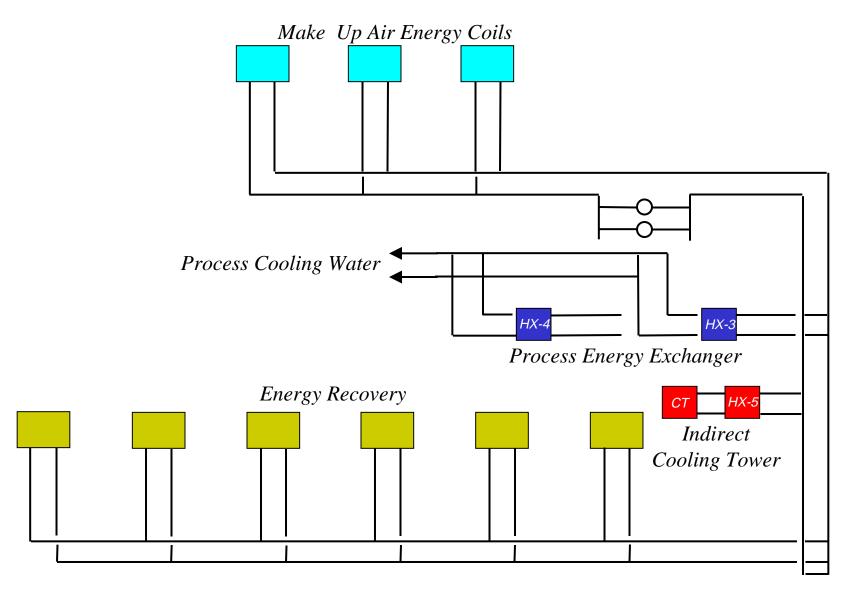
Lab Air



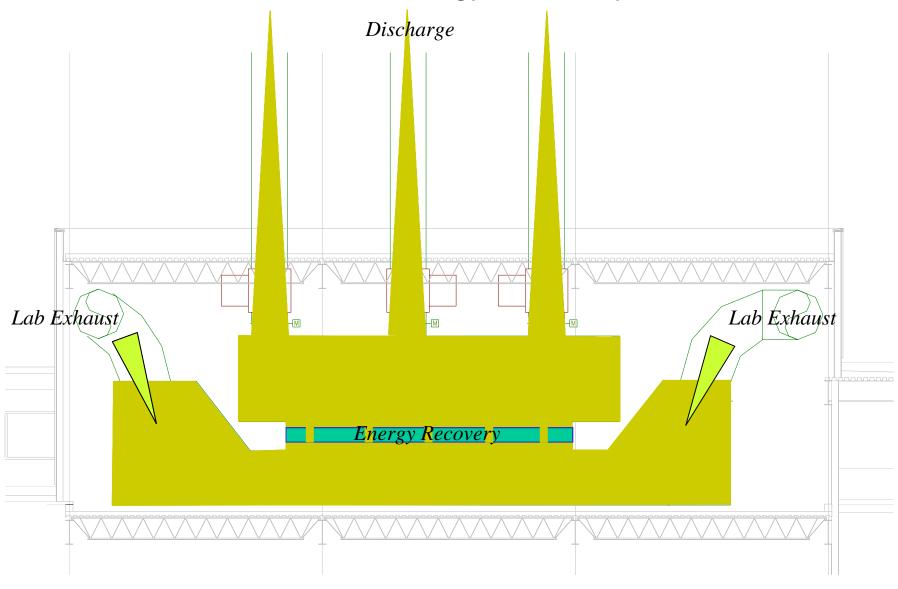
Make Up Air Units



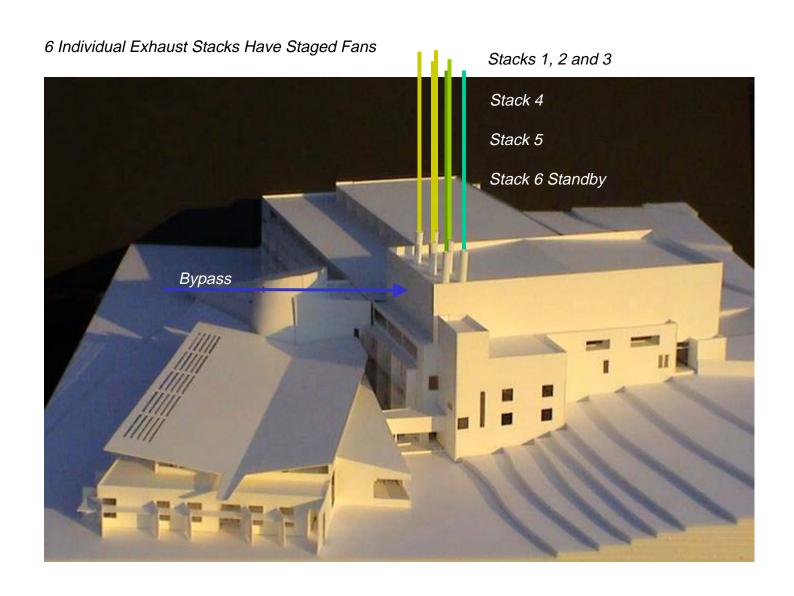
Energy Recovery Flow Diagram

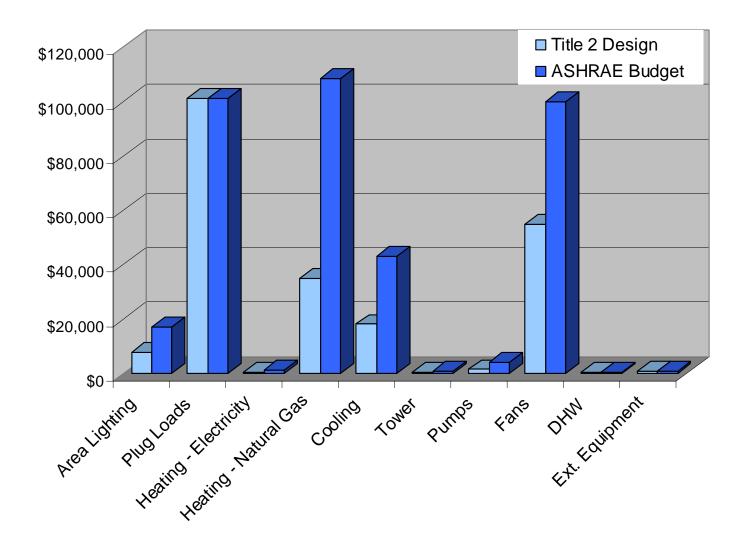


Exhaust Energy Recovery



Exhaust Air System





Annual Cost Comparison

